Open Source on the Mainframe in 1960, 1999, and Today

Elizabeth K. Joseph, IBM
@pleia2

SeaGL 2020
I did on-prem things, then cloud things, now I do mainframe things... which are also on-prem and cloud things!
What is a mainframe?
What is a mainframe?
IBM Z / s390x / zArchitecture

190 5.2ghz processor units (PUs), with 12 cores per chip

But also...

• 40TB of RAM
• 60 PCIe control units across 12 PCIe I/O drawers
• 22 dedicated I/O offload processors (SAPs) pre-allocated per system
Open source since when?

Lots of free and open source software stories start with Unix.

This one doesn't.
SHARE-ing since 1955!

• In 1955, the volunteer-run SHARE Inc\(^1\) was founded by users of the IBM 701.

• A key resource for this organization was the **SHARE library of software** that systems programmers would share among their peers, *freely*.

• In 1959, SHARE released the **SHARE Operating System (SOS)**, one of the first true "operating systems"\(^1\) and Wikipedia says of SOS:

  "SOS was one of the first instances of "commons-based peer production" now widely used in the development of free and open-source software such as Linux and the GNU project."

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\(^1\) [https://www.share.org/](https://www.share.org/)

Computers didn't always have time-sharing

Papers discussing time-sharing were published as early as 1959, but Compatible Time-Sharing System (CTSS) was first demoed by MIT on an IBM 709 in 1961.
What do you think about virtualization, 1972?

The first releases of VM\(^1\) came as VM/370 in 1972.

They were the product of a collaboration between organizations, including companies, universities, and government entities has continued through the decades in the VM community.

In Melinda Varian’s VM and the “VM Community: Past, Present, and Future”\(^2\) paper, she highlights key moments in VM history and the parties involved.

*(Fun fact: IBM wasn’t so convinced)*

\(^1\) [https://en.wikipedia.org/wiki/VM_(operating_system)]
\(^2\) [http://www.leeandmelindavarian.com/Melinda/]
IBM: “I don’t think anyone needs VMs” (paraphrased)

The Doubtful Decade.
But it got better!

The Doubtful Decade ended and VM community thrived, along with the technology and support from IBM.

In 1994 experimental TCP/IP support was added to VM, adding a key component to supporting Linux 5 years later.
Linux Origins: Bigfoot

Development by Linas Vepstas in 1998-1999 as a community effort.

“the Bigfoot (i370) port was started first”

Source: Linas Vepsta’s site on Linux on s390
https://linas.org/linux/i370.html
Why did the community want it?

“Why? Good question. One we've asked ourselves many times. Why do you do the things you do? If you think about it, you can probably find a hundred rationalizations for what your gut makes you to do. Here's some of ours:

- Stunt
- To Learn
- Because Its There
- Because Its Knarly, Duude!
- I/O
- Address Spaces and Access Lists
- VM
- The Business Model”

Source: https://linas.org/linux/i370-why.html
The big kids want in!

**IBM** released the first Linux kernel patches to support s390x in December 1999.

In October 2000, **SUSE** Linux Enterprise Server became the first, still in production, enterprise Linux to support s390x.

**Red Hat** quickly followed as the second, still in production, enterprise Linux for the mainframe.

**Ubuntu** support was announced in 2016 and began with Ubuntu 16.04.
At the Linux Foundation’s LinuxCon 2015, IBM announced the first Linux-only mainframe, the IBM LinuxONE on the keynote stage.

Today’s LinuxONE is in its third iteration, with the LinuxONE III released in September 2019.

*(Don’t worry, I’m not here to sell you one, but I can get you free access… stay tuned!)*
Growing IBM Z & LinuxONE Open Source Ecosystem

Linux Distributions & Virtualization
- Red Hat
- ubuntu
- SUSE
- KVM
- OpenSUSE
- fedora
- Alpine
- clefOS
- nginx
- HAProxy
- Mesos
- Zabbix
- Apache ZooKeeper
- etcd

Cloud & Container Services
- docker
- LXD
- openstack
- Kubernetes
- minikube
- Helm
- Istio
- okd
- AWS
- OpenShift
- Apache HTTP Server
- Compose
- Marathon
- Docker
- OpenJ9
- OpenJDK
- Apache Tomcat
- Apache Kafka
- Apache Flink
- Hyperledger Fabric
- Terraform
- Terraform
- WildFly
- TensorFlow

Languages & Runtimes
- Java
- JS
- Python
- Ruby
- Scala
- Go
- Node
- Rust
- Clojure
- Groovy
- Groovy
- EJP

DevOps/Automation
- Chef
- Ansible
- Puppet
- Jenkins
- Travis CI
- ANTLR
- Maven
- SonarQube
- Gradle
- SaltStack

Big Data, Observability, Analytics
- Flink
- Spark
- Kafka
- Fluentd
- Logstash
- Grafana
- Elasticsearch
- Kibana

Community Versions

Middleware
- CouchDB
- H2
- MongoDB
- Couchbase
- Cassandra
- Scylla

Databases
- RethinkDB
- Postgres
- SQL
- MySQL
- MariaDB

www.ibm.com/community/z/open-source-software/
Open Source Resources for Linux: Finding

- Search in your distro!
- Go directly to the project, do they have s390x builds?
- Verified Software List from IBM: https://www.ibm.com/community/z/open-source-software/
- DockerHub (IBM Z search): https://hub.docker.com/search?type=image&architecture=s390x
- Open Mainframe Project Software Discovery Tool (in development!)
  https://www.openmainframeproject.org/projects/software-discovery-tool
Open Source Resources for Linux: Porting

  - *This is that free access to LinuxONE I was talking about!*
- Jenkins instance for s390x maintained by the Oregon State University Open Source Lab (OSU OSL): https://osuosl.org/services/ibm-z/
- TravisCI build service for s390x (Beta trial for open source projects): https://docs.travis-ci.com/user/multi-cpu-architectures/
- Ubuntu Personal Package archives on Launchpad.net https://help.launchpad.net/Packaging/PPA
- OpenSUSE build service https://build.opensuse.org/
Cool, Linux.

What about z/OS?
<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
<th>Contributions</th>
<th>Download</th>
</tr>
</thead>
</table>
| Ansible             | Ansible is an automation tool for configuration and deployment of software | Contributions: [https://github.com/ansible/ansible](https://github.com/ansible/ansible)  
| Apache Spark        | Apache Spark is an analytics engine for large-scale data processing | Contributions: [https://github.com/IBM/Spark-on-zOS](https://github.com/IBM/Spark-on-zOS)  
| Conda               | Package, dependency and environment management               | Download: [https://anaconda.org/IzODA/repo](https://anaconda.org/IzODA/repo) | |
## Open Source Software on z/OS

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Contributions</th>
<th>Download</th>
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<tbody>
<tr>
<td>Zowe</td>
<td>Zowe, modern interfaces to interact with z/OS, allows to work with z/OS in a way that is similar to what you experience on cloud platforms today</td>
<td><a href="https://github.com/zowe/community/blob/master/README.md">https://github.com/zowe/community/blob/master/README.md</a></td>
<td><a href="https://www.zowe.org/download.html">https://www.zowe.org/download.html</a></td>
</tr>
<tr>
<td>Galasa</td>
<td>Galasa is an integration test framework</td>
<td><a href="https://galasa.dev/">https://galasa.dev/</a></td>
<td><a href="https://github.com/galasa-dev">https://github.com/galasa-dev</a></td>
</tr>
<tr>
<td>Node</td>
<td>JavaScript runtime built on Chrome's V8 JavaScript engine</td>
<td></td>
<td><a href="https://github.com/ibmruntimes/node">https://github.com/ibmruntimes/node</a></td>
</tr>
<tr>
<td>Python</td>
<td>Open Enterprise Python is an industry-standard Python interpreter for z/OS</td>
<td></td>
<td><a href="https://developer.ibm.com/mainframe/2020/06/22/python-for-zos-now-available/">https://developer.ibm.com/mainframe/2020/06/22/python-for-zos-now-available/</a></td>
</tr>
<tr>
<td>Perl</td>
<td>Perl is a general-purpose, interpreted, dynamic programming language</td>
<td></td>
<td><a href="https://www.rocketsoftware.com/zos-open-source">https://www.rocketsoftware.com/zos-open-source</a></td>
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<td>PHP</td>
<td>A server-side scripting language, offering a simple and universal solution for easy-to-program dynamic Web pages</td>
<td><a href="https://www.rocketsoftware.com/zos-open-source">Download</a></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>A functional language for primarily for data analytics</td>
<td><a href="https://www.rocketsoftware.com/product-categories/mainframe/r-for-zos">Download</a></td>
<td></td>
</tr>
<tr>
<td>Git</td>
<td>A version control system (VCS) for tracking changes in computer files and coordinating work on those files among multiple people</td>
<td><a href="https://www.rocketsoftware.com/zos-open-source/tools">Download</a></td>
<td></td>
</tr>
<tr>
<td>Open Liberty</td>
<td>A lightweight open framework for building fast and efficient cloud-native Java microservices</td>
<td><a href="https://github.com/OpenLiberty/open-liberty">Contributions</a>, <a href="https://openliberty.io">Download</a></td>
<td></td>
</tr>
<tr>
<td>zECS</td>
<td>Enterprise Caching System (zECS) is a cloud enabled distributed key/value pair caching service</td>
<td><a href="https://github.com/walmartlabs/zECS">Download</a></td>
<td></td>
</tr>
<tr>
<td>Bash</td>
<td>Bash is an sh-compatible shell providing users a command-line interpreter</td>
<td><a href="https://www.rocketsoftware.com/zos-open-source/tools">Download</a></td>
<td></td>
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OpenMainframeProject.org

- Project Hosting
- Project support (VMs, CI)
- Events (Summits! Mini-summits!)
- Communication (Chat, mailing lists, forums)
- Mentorship program
Working with open source in the enterprise

Some parting thoughts for open source types
Questions?

Elizabeth K. Joseph | @pleia2

lyz@princessleia.com | lyz@ibm.com

Thank you!

Photo Copyright@IBM via Andreas Weßling. More pretty glass model pictures at:
http://ibm.biz/IBMCCBOE_z15T02_pictures